

REMARKS

The following amendment amends Claims 1, 8 and 21 to correct typographical errors, to address issues concerning improper antecedent basis and to clarify Applicant's claimed invention. No new matter has been added. The amendments to Claims 1, 8 and 21 are not directed to any art rejection. Accordingly, we understand that any further rejection of any of Claims 1-24 based on new art is to be non-final.

Now in the application are Claims 1-24 of which Claims 1, 8, 17 and 21 are independent. The following comments address all stated grounds for rejection, and place the presently pending claims, as identified above, in condition for allowance.

Claim Rejections under 35 U.S.C. § 102

Claims 1-12, 14-19, and 21-24 stand rejected under 35 U.S.C. § 102. For ease of the discussion below each rejection will be discussed separately.

A. Rejection of Claims 1-7 under 35 U.S.C. § 102(b):

Claims 1-7 stand rejected under 35 U.S.C. § 102(b) as being anticipated by U.S. Patent No. 5,991,471 of Yu (hereinafter "Yu"). Applicant respectfully traverses this rejection and contends that Yu does not anticipate Claims 1-7.

Claims 1-7 are directed to a method of processing an optical signal in an optical communications network. The method includes a step of inputting an optical signal to an input of a modulator. The method further includes a step of overdriving the modulator with a modulation voltage signal value to produce a modulated optical signal having an extinction ratio reduced from maximum as measured before propagation over the optical communications network. The step of overdriving yields a bit error rate improvement at a receiver of the modulated optical signal having an extinction ratio reduced from maximum after propagation over the optical communications network.

A feature of the claimed invention is the ability to reduce the extinction ratio of a modulated optical signal to yield a bit error rate improvement at a receiver of the modulated optical signal. Accordingly, the claimed invention advantageously improves a bit error rate of a modulated optical signal while reducing the extinction ratio of the signal and therefore constructively realizing a benefit from a change of required average

power (i.e. “power penalty”). Hence, the claimed invention gains an increase in data transport performance over an optical medium although a reduction of the extinction ratio of the modulated signal may result in an increase in average power.

The Yu reference does not anticipate the subject matter of Claims 1-7. The Yu reference is directed to a configurable chirp Mach-Zehnder optical modulator having asymmetric arm lengths to avoid a reduction in the extinction ratio of a modulated optical signal. Yu fails to disclose a method of processing an optical signal having a step of overdriving a modulator with a modulation voltage signal value to produce a modulated optical signal having an extinction ratio reduced from maximum as measured before propagation over an optical communications network to yield a bit error rate improvement at a receiver of the modulated signal.

The Examiner cites column 1, line 56 to column 2, line 4 of Yu as disclosing the step of inputting and the step of overdriving the modulator recited in Claims 1-7. A careful reading of the cited passage yields a number of discrepancies and possible mischaracterizations. For example, in column 2, line 3 of Yu, a prior U.S. Patent No. 5,524,076 of Rolland, *et al.* (hereinafter “Rolland”) is referred to in a negative manner for disclosing a reduction in a signals extinction ratio. The cited passage indicates that the Rolland reference issued as a U.S. Patent on April 6, 1996, however, the front page of Rolland reference indicates an issue date of June 4, 1996. It appears that the author of the Yu reference mistakenly confuses two or more prior art references. Rolland is concerned with controlling the ratio of optical power between individual wave guide arms of a Mach- Zehnder optical modulator. *See* column 3, lines 9-27 of Rolland. The cited passage from Yu, specifically the portion that reads “While negative chirp can be induced by designing the y-junction to inject less optical power into the more deeply biased modulator arm and employing a small amount of overdrive, the back to back extinction ratio is degraded.” appears ambiguous and not entirely accurate.

Applicant directs the Examiner’s attention to column 6, lines 1-5 of Rolland where the text indicates that the discussion is broken down into two separate and distinct discussions with little if any overlap in technical features. The first discussion relates to modulators having an input Y-branch or beam splitter delivering equal optical power to respective waveguide arms. The second discussion considers the effect on chirp

characteristics of various optical power ratios incident on respective waveguide arms. The author of the Yu reference appears to combine these two teachings without any suggestion to do so found in the Rolland reference or the Yu reference further illustrating her mistaken confusion with regard to prior art references.

Furthermore, Applicant contends that the Rolland reference lacks a disclosure of overdriving an optical modulator. The majority of column 5 of Rolland is dedicated to the discussion of optical modulators that deliver equal optical power to respective waveguide arms. Nowhere in Rolland is there a disclosure to “employ a small amount of overdrive”. It is unclear from the Yu reference and from the Rolland reference what is meant by the phrase “a small amount of overdrive”. Specifically, it is unclear if this phrase is referring to overdriving a modulator with an optical signal, overdriving a modulator with a modulation signal, or both. Nevertheless, nowhere in Rolland is there a disclosure of overdriving a modulator in any of these manners. Rolland at column 5, lines 19-31 discusses “one example” of modulation voltages applied to an optical modulator and further discussed in column 5, lines 48-57 another example of modulation voltages applied to an optical modulator. Nowhere in Rolland is there any discussion that relates the two sets of voltages or indicates that one set of voltages results in overdriving the modulator. Furthermore, even if one skilled in the art was capable of interpreting the different voltage values of Rolland as values that overdrive a modulator there is no disclosure that such overdriving causes a modulated optical signal having an extinction ratio reduced from maximum to yield a bit error rate improvement at a receiver of the modulated optical signal after propagation over the optical communications network.

Moreover, prior to Applicant’s discovery of the beneficial aspect of overdriving an optical modulator with a modulation voltage signal it was typically held that a reduction in the extinction ratio of a modulator optical signal results in a change in the required average power of the optical signal (i.e. “power penalty”) for no benefit or advantage. That is, the reduction in the extinction ratio results in an increase in optical power without any benefit to signal quality. In contrast, Applicant has discovered that by overdriving an optical modulator with a modulation voltage signal results in a modulated optical carrier having a less than maximum extinction ratio to yield an improvement in a bit error rate of the modulated optical carrier.

For at least these reasons, the Yu reference does not disclose a step of overdriving a modulator with a modulation voltage signal value to produce a modulated optical signal having an extinction ratio reduced from maximum to yield a bit error rate improvement at a receiver of the modulated optical signal after propagation over an optical communications network. Accordingly, the Yu reference fails to anticipate Claims 1-7. Hence, Applicant respectfully requests the Examiner to reconsider and withdraw the rejection of Claims 1-7 under 35 U.S.C. § 102(b).

B. Rejection of Claims 8-12 and 14-16 under 35 U.S.C. § 102(b):

Claims 8-12 and 14-16 stand rejected under 35 U.S.C. § 102(b) as being anticipated by Yu. Applicant respectfully traverses this rejection and contends that Yu does not anticipate Claims 8-12 and 14-16.

Claims 8-12 and 14-16 are directed to a method for improving a bit error rate of an optical signal transmitted over an optical transmission medium. The claimed method includes steps of providing a stabilized light beam to an optical modulator and asserting at the optical modulator, a modulation drive signal having a peak to peak voltage value. The claimed method further includes a step of improving the bit error rate of the optical signal transmitted across the optical transmission medium by increasing the peak to peak voltage value of the modulation drive signal to overdrive the optical modulator to cause the optical signal to have a reduced extinction ratio as measured before propagation over the optical transmission medium to a receiver coupled to the end of the optical transmission medium.

Nowhere does the Yu reference disclose a step of improving the bit error rate of an optical signal transmitted across an optical transmission medium by increasing the peak to peak voltage value of a modulation drive signal to overdrive the optical modulator to cause the optical signal to have a reduced extinction ratio as measured before propagation over the optical transmission medium. The Yu reference is not concerned with increasing a peak to peak voltage value of a modulation drive signal to improve a bit error rate of an optical signal. In fact, the Yu reference is concerned with avoidance of a reduction in the extinction ratio of a modulated signal.

Accordingly, the Yu reference does not anticipate Claims 8-12 and 14-16. Therefore, Applicant respectfully requests the Examiner to reconsider and withdraw the rejection of Claims 8-12 and 14-16 under 35 U.S.C. § 102(e).

C. Rejection of Claims 17-19 under 35 U.S.C. § 102(b):

Claims 17-19 stand rejected under 35 U.S.C. § 102(b) as being anticipated by the Yu reference. Applicant respectfully traverses this rejection and contends that the Yu reference does not anticipate Claims 17-19.

Claims 17-19 are directed to a method for modulating an optical carrier to yield an improved bit error rate of the modulated optical carrier. The method includes a step of asserting the optical carrier at an optical input of an optical modulator. The method further includes a step of overdriving the optical modulator with a modulation voltage signal to produce the modulated optical carrier whereby overdriving the optical modulator causes the modulated optical carrier to have a less than maximum extinction ratio to improve the bit error rate of the modulated optical carrier as received by a receiver of the optical carrier.

The Yu reference does not anticipate Claims 17-19. The Yu reference fails to disclose a step of overdriving an optical modulator with a modulation voltage signal to produce a modulated optical carrier whereby the overdriving of the optical modulator causes the modulator optical carrier to have less than maximum extinction ratio to improve the bit error rate of the modulated optical carrier as received by a receiver of the optical carrier. The Yu reference is concerned with avoiding a less than maximum extinction ratio. Furthermore, there is no disclosure in the Yu reference to overdrive an optical modulator with a modulation voltage signal to cause the modulator optical carrier to have a less than maximum extinction ratio to improve the bit error rate of the modulator optical carrier.

Applicant contends that the Yu reference fails to anticipate Claims 17-19 and therefore respectfully requests the Examiner to reconsider and withdraw the rejection of Claims 17-19 under 35 U.S.C. § 102(b).

D. Rejection of Claim 21-24 under 35 U.S.C. § 102(b):

Claims 21-24 stand rejected under 35 U.S.C. § 102(b) as being anticipated by the Yu reference. Applicant respectfully traverses this rejection and contends that the Yu reference does not anticipate Claims 21-24.

Claims 21-24 are directed to an apparatus for modulating an optical carrier. The apparatus includes an optical modulator and a drive voltage controller to control a modulator voltage value supplied to the optical modulator to cause the optical modulator to produce a modulated optical carrier having an extinction ratio reduced from a maximum as measured before propagation over a signal mode fiber. The modulation voltage value supplied to the optical modulator exceeds a voltage value necessary to produce a maximum extinction ratio.

The Yu reference is concerned with asymmetrical waveguide arm length in an optical modulator to avoid a reduction in the extinction ratio of a modulated optical signal. Nowhere does the Yu reference disclose an apparatus for modulating an optical carrier having a drive voltage controller to control a modulated voltage supplied to an optical modulator to cause the optical modulator to produce a modulated optical carrier having an extinction ratio reduced from a maximum where the drive voltage controller controls the modulated voltage value supplied to the optical modulator so that it exceeds a voltage value necessary to produce the maximum extinction ratio of the modulated optical signal.

Accordingly, Claims 21-24 are not anticipated by the Yu reference. Hence, Applicant respectfully requests the Examiner to reconsider and withdraw the rejection of Claims 21-24 under 35 U.S.C. § 102(b).

Rejections under 35 U.S.C. § 103

Claims 13 and 20 stand rejected under 35 U.S.C. § 103 as being unpatentable over Yu in view of U.S. Patent No. 6,031,945 of You, *et al.* (hereinafter “You”). For ease of the discussion below each rejection will be discussed separately.

A. Rejection of Claim 13 under 35 U.S. C. § 103(a):

Claim 13 stands rejected under 35 U.S.C. § 103(a) as being unpatentable over Yu in view of You. Applicant respectfully traverses this rejection and contends that Yu in view of You does not detract from the patentability of Claim 13.

Claim 13 depends, directly or indirectly, upon Claim 8 and therefore incorporates the novel features of Claim 8. Claim 13 is directed to an optical modulator that comprises a polymer-based Mach- Zehnder modulator.

The Yu reference does not disclose an optical modulator comprising a polymer-based Mach- Zehnder modulator. The You reference is cited for teaching a polymer-based Mach- Zehnder modulator.

The You reference fails to bridge the factual deficiencies of the Yu reference. Nowhere in the You reference is there a teaching or suggestion of a method for improving a bit error rate of an optical signal transmitted over an optical transmission medium by increasing a peak to peak voltage value of a modulation drive signal to overdrive an optical modulator.

Accordingly, Applicant contends that the Yu reference in view of the You reference fails to teach and suggest each and every feature of Claim 13. Accordingly, Applicant respectfully requests the Examiner to reconsider and withdraw the rejection of Claim 13 under 35 U.S.C. § 103(a).

B. Rejection of Claim 20 under 35 U.S.C. § 103(a):

Claim 20 stands rejected under 35 U.S.C. § 103(a) as being unpatentable over the Yu reference in view of the You reference. Applicant respectfully traverses this rejection and contends that the Yu reference in view of the You reference fails to detract from the patentability of Claim 20.

Claim 20 which depends, either directly or indirectly, upon independent Claim 17, and thereby incorporates the novel features of an independent Claim 17. Claim 20 is directed to a polymer-based Mach-Zehnder modulator.

The You reference fails to bridge the factual deficiencies of the Yu reference. Nowhere in the You reference is there a teaching or suggestion of a method to yield a bit error rate of a modulated optical carrier by overdriving an optical modulator with a

modulation voltage signal to produce the modulated optical carrier. The step of overdriving causes the modulated optical carrier to have a less than maximum extinction ratio to improve the bit error rate of the modulated optical carrier as received by a receiver of the optical carrier.

Accordingly, Applicant contends that the Yu reference in view of the You reference fails to teach and suggest each and every feature of Claim 20. Accordingly, Applicant respectfully requests the Examiner to reconsider and withdraw the rejection of Claim 20 under 35 U.S.C. § 103(a).

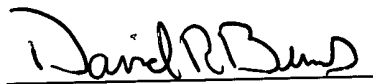
CONCLUSION

In view of the remarks set forth above, Applicants contend that Claims 1-24 presently pending in this application, are patentable, and in condition for allowance. If the Examiner deems there are any remaining issues, we invite the Examiner to call the undersigned at (617) 227-7400.

Respectfully submitted,

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Dated: October 9, 2003